Indian Institute of Technology Kanpur
National Programme on Technology Enhanced Learning (NPTEL)
Course Title
Engineering Graphics

Lecture – 16
Oblique Projections-Part-IV

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So last class we have finished up to sectioning and different types of sections, just overview.

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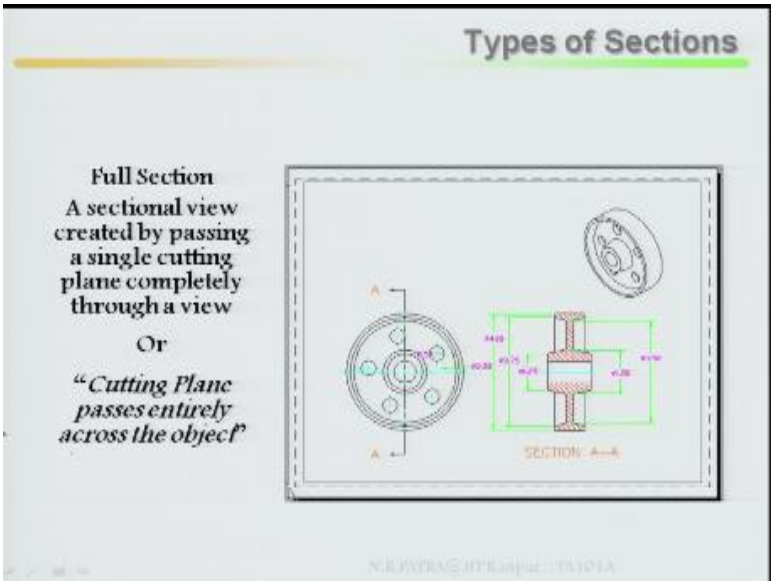

First one is your full view, cutting plane passes entirely across the object.

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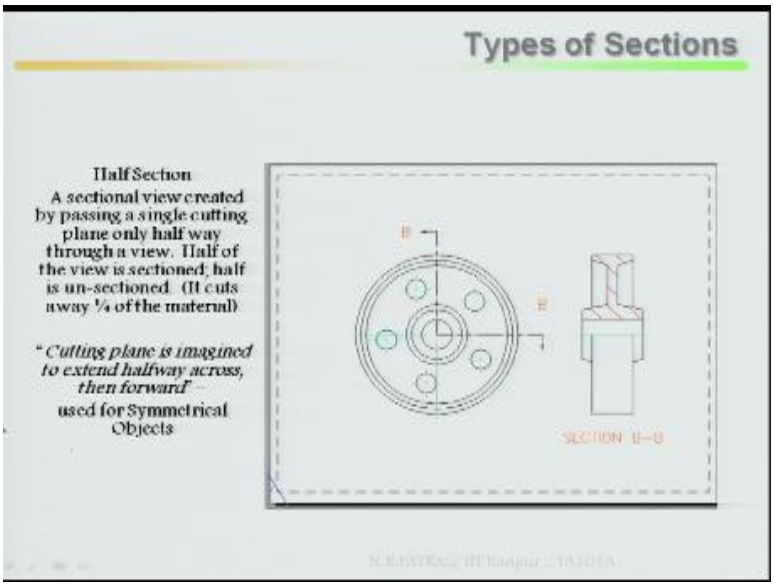

Second one is your half section, only half of the when there is a symmetry both the sides only half of the sectioning can be done.

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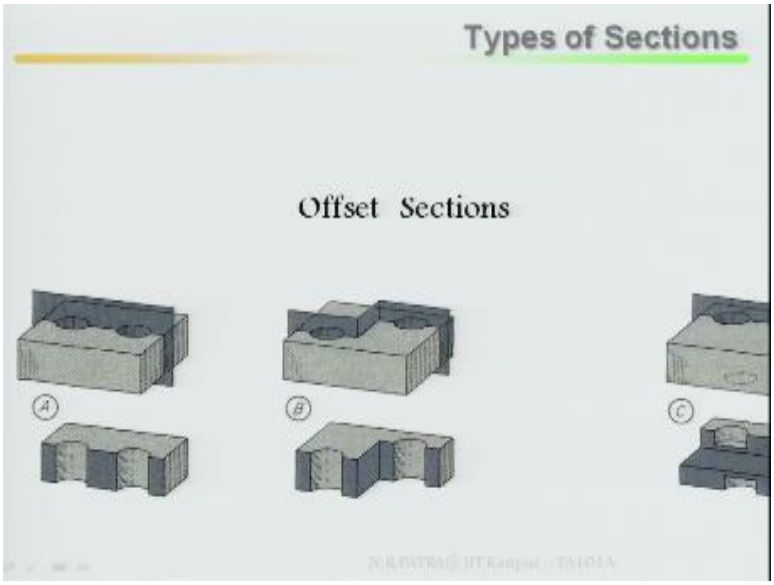

Then offset sections.

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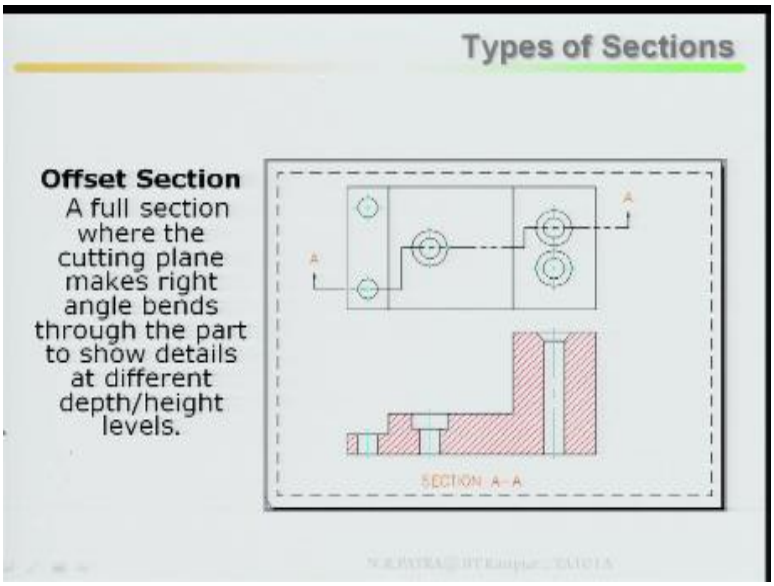

If there are full section where the cutting plane makes right angle bend through the part 2. So the details are different depth and height to so the parts in different depth as well as in height in that case you need to have to have your offset section.

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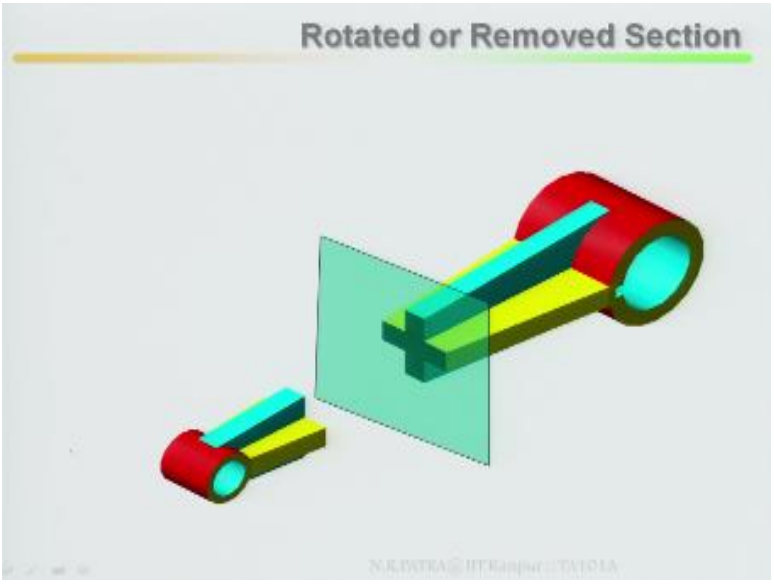

Then rotated in removed section.

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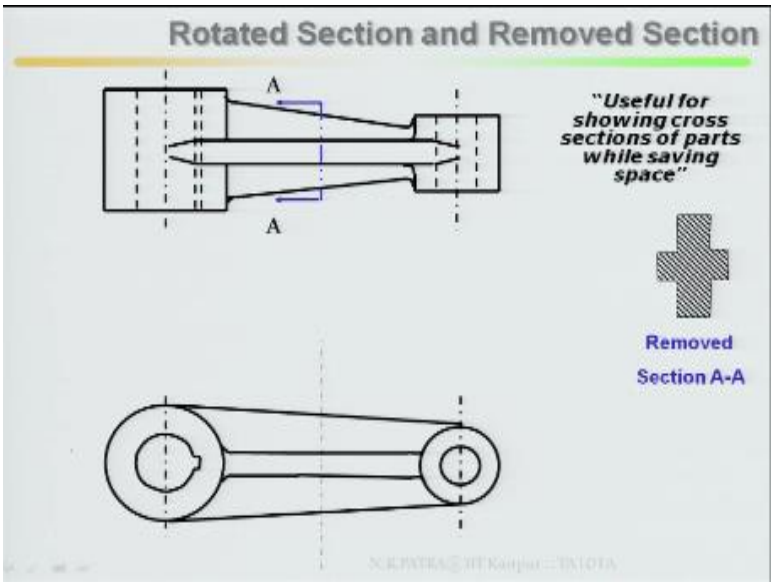

Middle part, how it looks? Then it has been rotated to see both the sides how it looks both front as well as rear, then this rotated section has been removed and placed separately.

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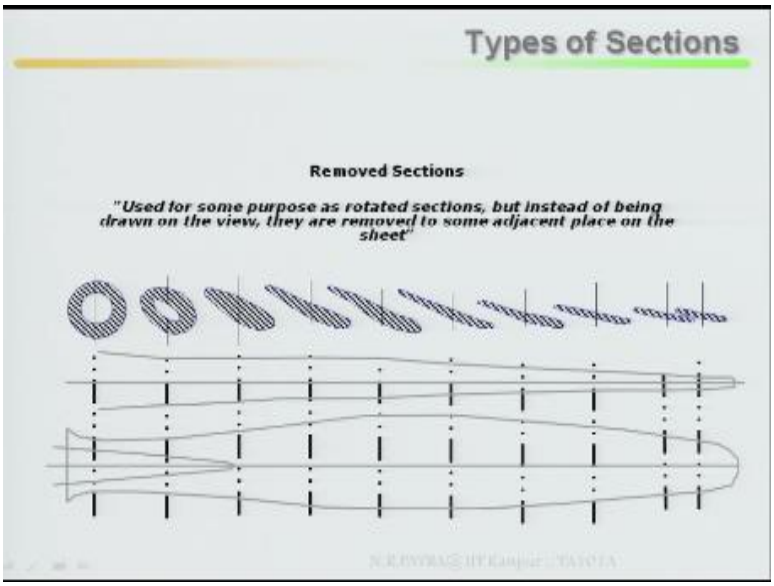

As I vary from section to sections the removed section looks like this, it is changing from one plane to other plane.

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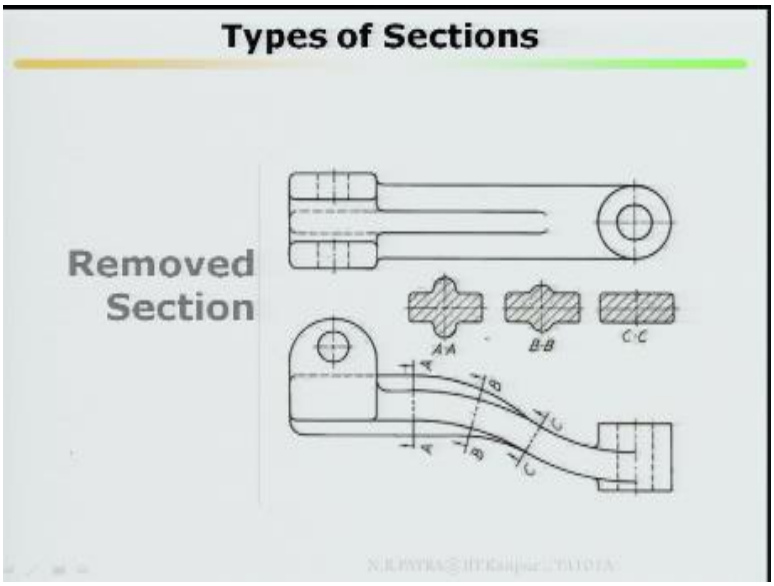

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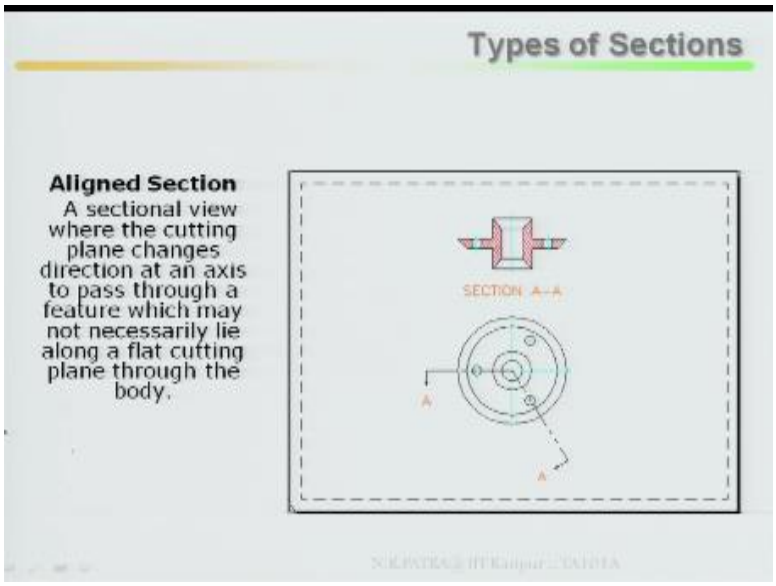

Then align sections, align sections if there are cases where your holes are not symmetry and at the same times maybe holes are different holes, then you can put align sections. So that you can, so pictures inside this hole.

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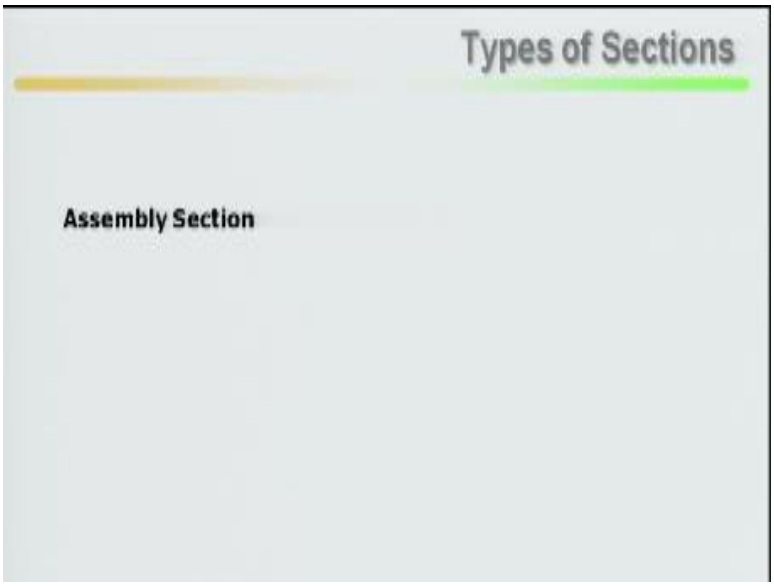

Then last one is more important one that is your assembly sections particularly it has been used in automobile were different part you have to first assemble and prepare the object. And take the sections and show the sectioning of different parts.

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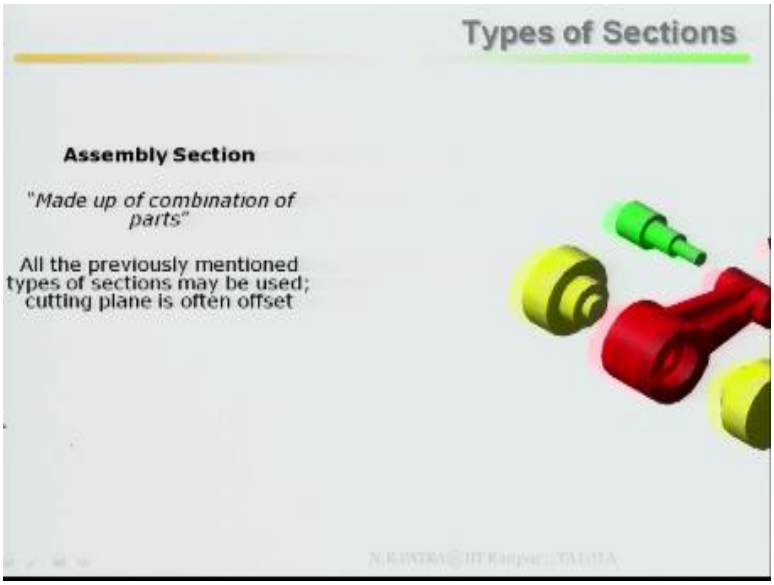

That means it is the combination of different parts example these are the different parts and it has been assembled first then sectioning has been made.

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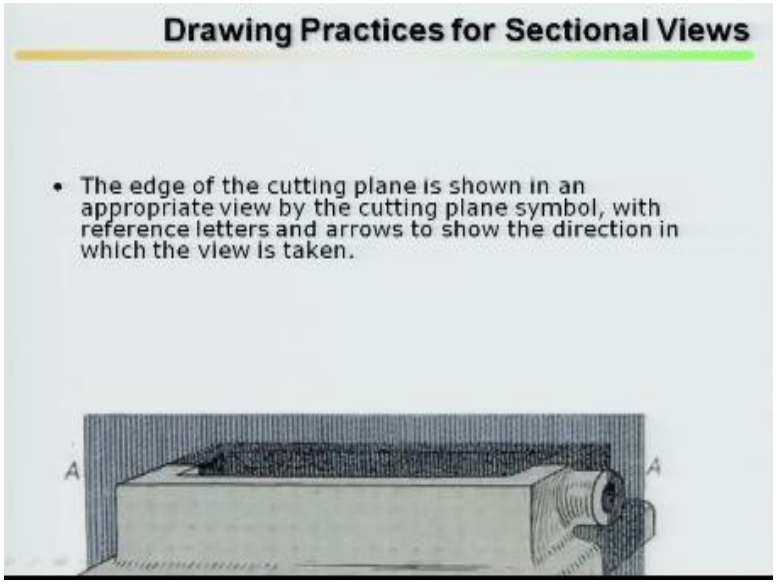

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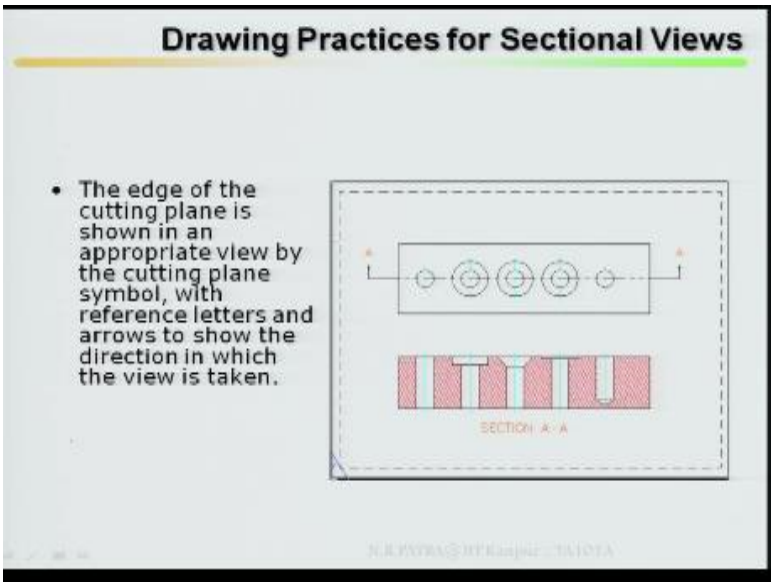

This part also have completed drawing practice for sectional view.

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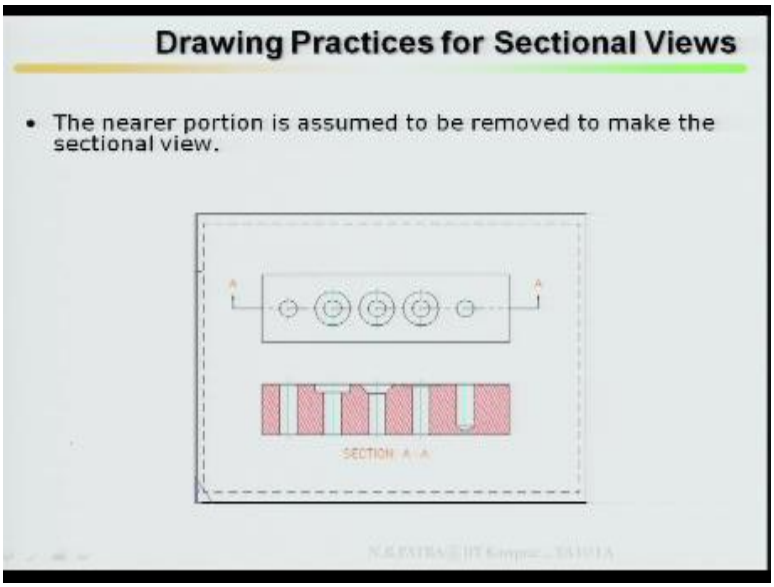

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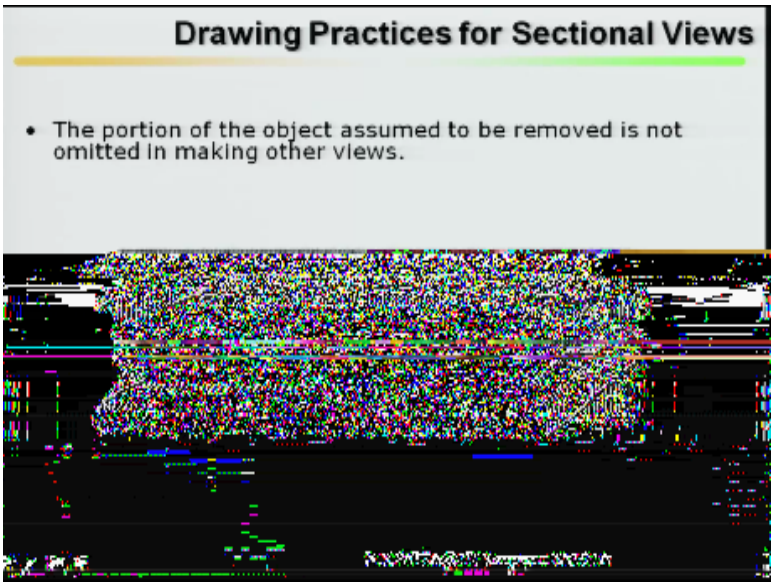

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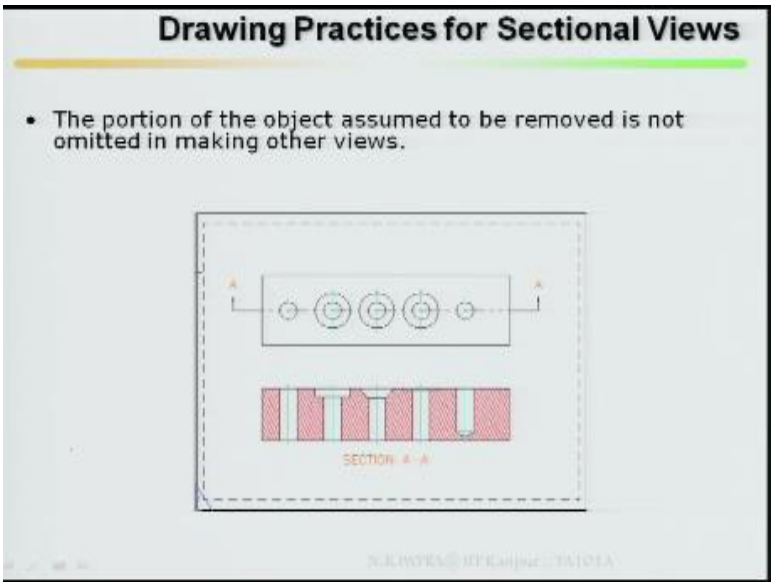

Just for a preview what I have completed last class.

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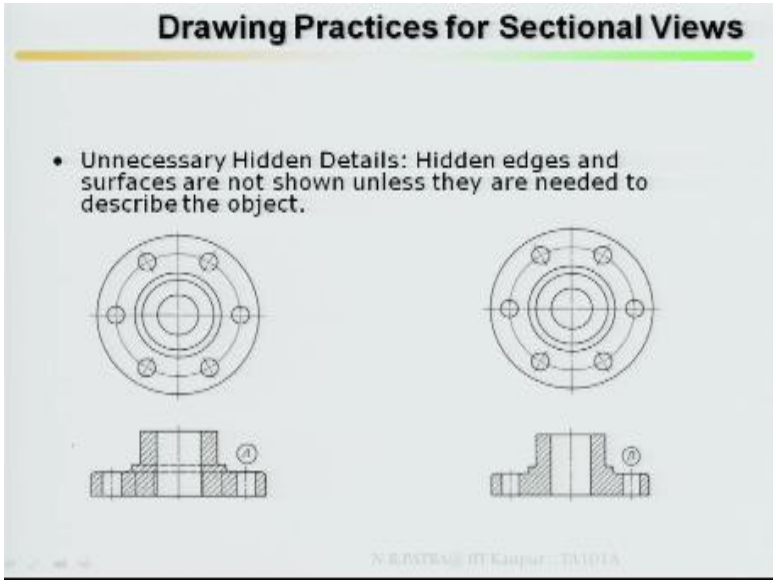

Now if you looked at here hidden edges surfaces are not shown unless it is not required.

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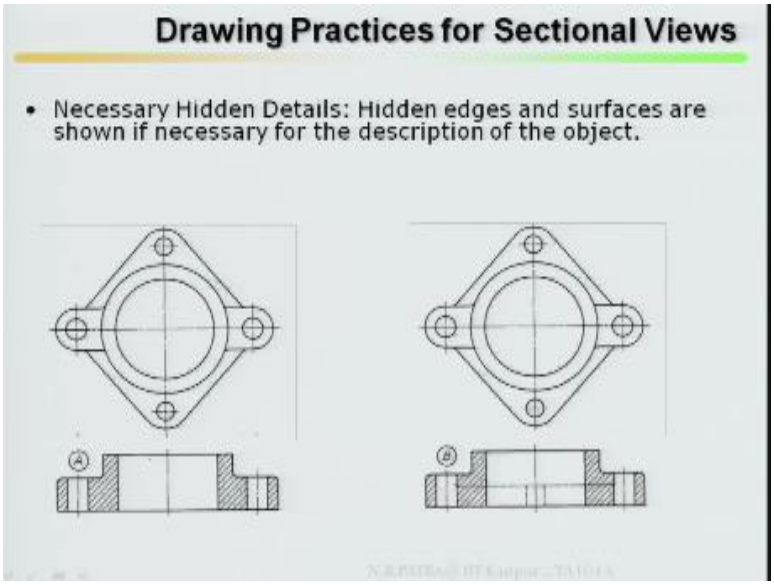

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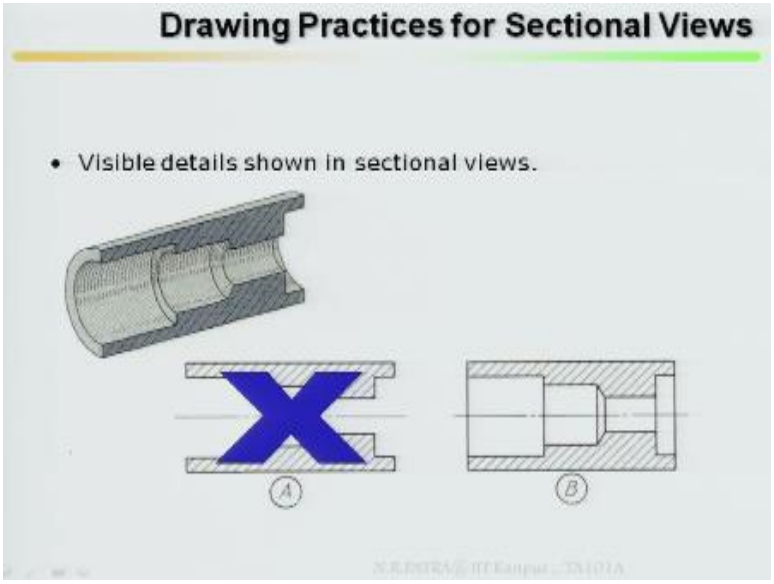

Then invisible details shown in the sectional view once you take a section, inside the sectional view visible details example 1 a and b. So example a is in correct, particularly striking at section here for a it is incorrect but section taking at section the sectional view in b it is correct.

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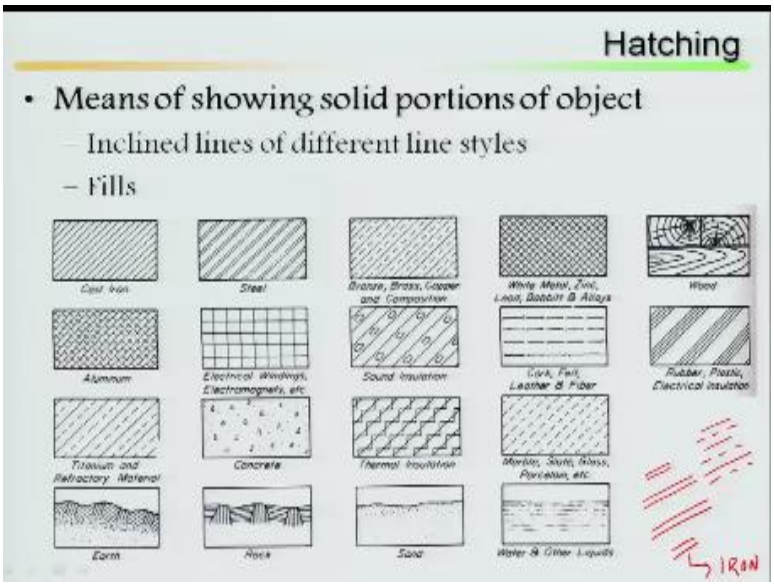

Now come to the hatching, for different materials there are different types of hatchings once you put that hatching during sectioning that means it shows that, that material is made up of what kind of material, if you looked at here custodian how is your hatching has been done and still particularly still two parallel lines then there is a gap still is two parallel lines then there is a gap again two parallel lines parallel to earlier two parallel lines two parallel lines.

So once you do the hatching then somebody can recognize this is this material is made of steel, bronze, brass, copper and compositions how it looks? It looks one solid line then parallel dotted line then solid line then parallel dotted line then solid line then parallel dotted lines. White metal zinc, lead, alloys how it looks? Wood how it looks? Aluminum, aluminum you have to do the hatching this.

Electrical windings sound insulations, cork, leather, rubber and plastic look at the rubber and plastic then titanium and refractory material concrete, concrete is very this is standardized symbol for civil engineering concrete, thermal insulations, marble then water also you can show

it, sand, rock and earth, these are all few examples few examples sometimes what happen these are all standardized.

Once you do the hatching by means the designer can understand this material made up with this cast iron, beyond this any material if you are getting any material during your sectional view that is not standardized always you can prescribe with this I can always in the side I can so that this is made of you can say that this is cast iron or iron in this way you can always you can you're your this material.

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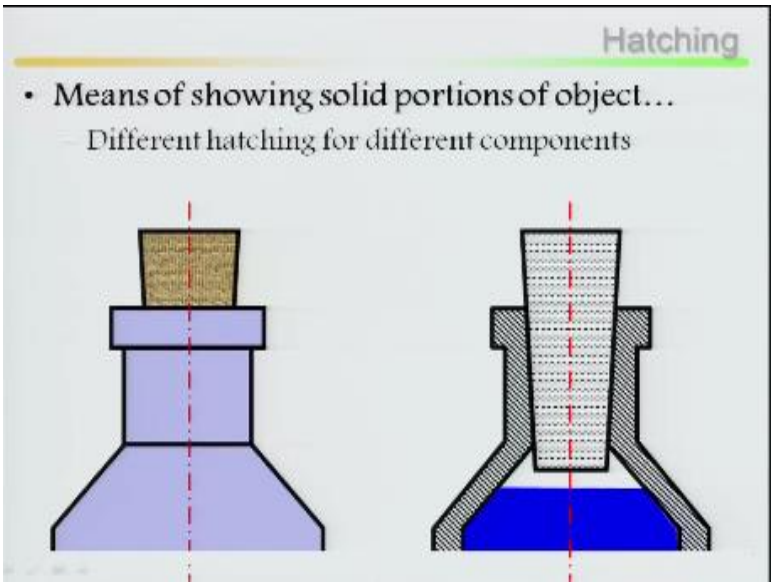

Meaning of showing solid person of a object different hatching for different components, we have started now hatchings.

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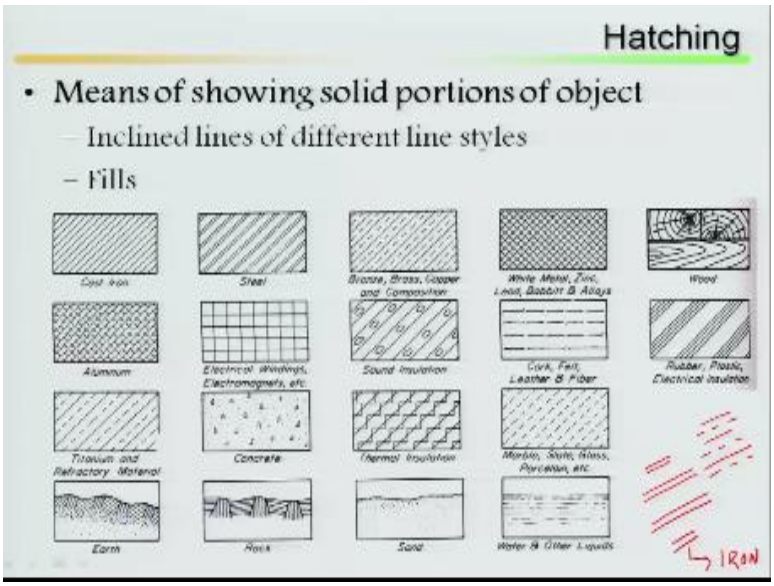

First one is your means of solid person of the objects solid person of the objects what are the different hatching lines?

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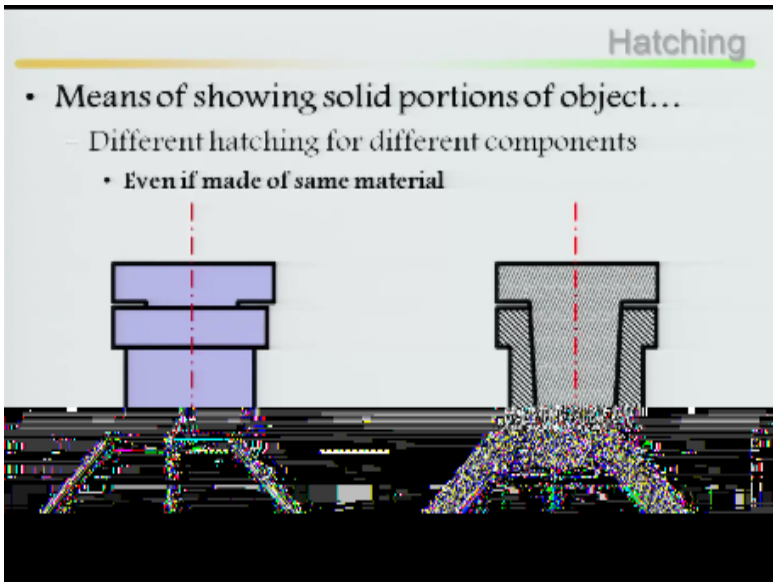

Now different hatching for different components it may possible this material particularly in this case this material is a made up of steel with filled by means of by stop stopper by means of a cork. So look at here by means of this hatching it shows that this is this material consists of steel and this is a cork. Even if made of same material even if it is made of same material look at here.

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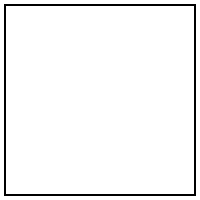

Even if it is made of same material the hatching should be preferable direction of the hatching should be 30 degree, 60 degree and 75 degree. This is your preferable directions with respect to their it should be 30 degree, 60 degree and 75 degree it should not be arbitrary in this case this is wrong because here hatching angle is different here this side hatching angle is different because this material consists of the same material.

Once you cut it there is a buoyed here this material is the same material . So for the same materially different hatching cannot be done. So this is wrong, if you looked at this side this is right because this material is there again direction of the hatching has been maintained with this 30 degree. So three hatching has to be done with the direction particularly 30degrees sixty-degree and 75 degree this is second principle this is correct.

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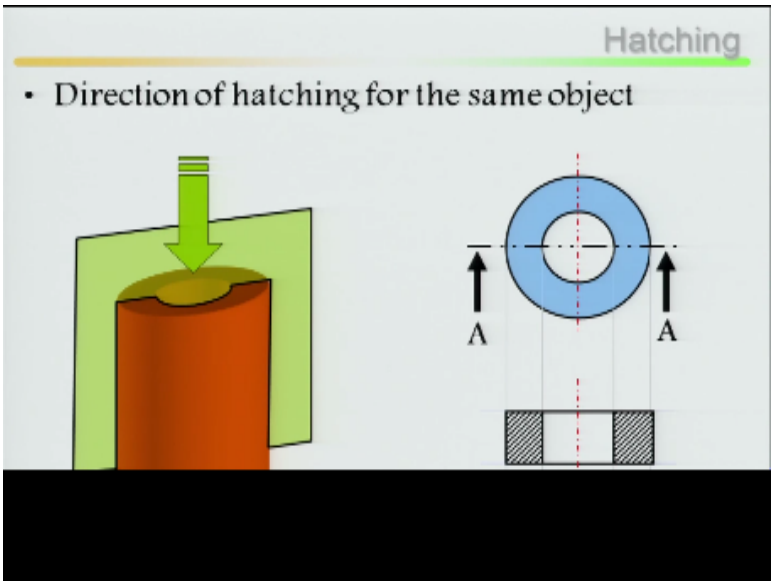

Now direction of hatching for the same object if I cut it then I have taken out the front and looking at from the front side front view, how your hatching is? It should be in the direction of the hatching for the same object section at AA.

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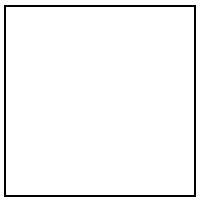

Same object same direction of hatching look at this same objects same direction of your hatching if you looked at the both this object same object only hatching is different if you looked at here in this case hatching in the same directions sixty-degree directions but here one part is reversed direction one part Is the sixty degree directions that means this is completely wrong, you cannot do same objects.

Suppose this is the object for example this is the object this object this is a hollow part and this object is made up of steel if I do the hatching I will do it here similarly I will do it here I cannot do I cannot do this side particularly how it is wrong I cannot do this side this way of hatching, this is wrong if you want to maintain then you have to maintain same, same in the both the sides.

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Now let us start with examples few examples.

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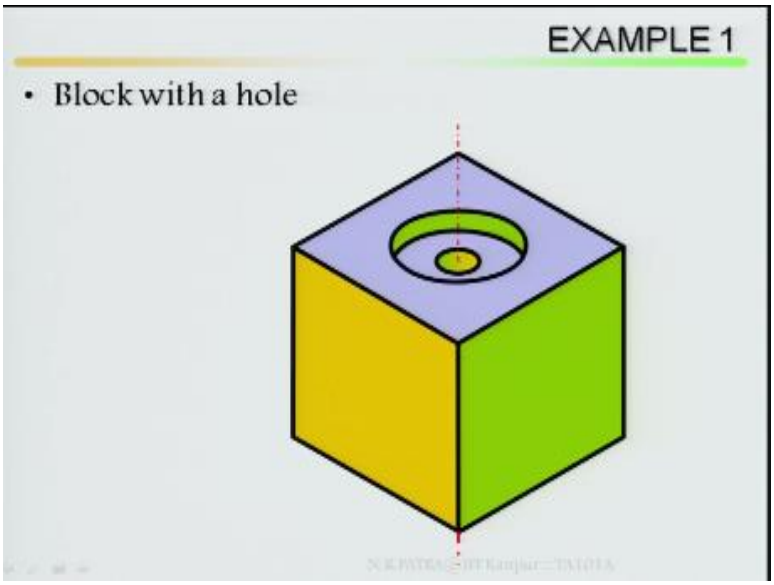

Block with a hole example 1 there is a block and with a hole, imagine this block there is a block and if I look at this isometric view this is a block there is a hole at the top this hole is continuing upto certain distance then after that there is a inner hole also there that means this hole is not throughout.

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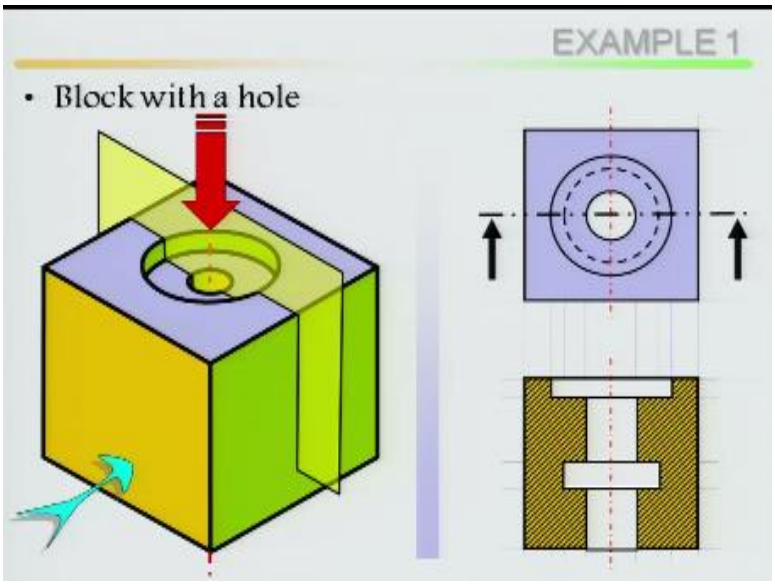

Now you are looking this object from this side, take this object from the top view you can even put it at the top view, then front view you draw, how it looks? Then take a cutting plane, cutting plane in such a way that you can see the inside features or inside view I am taking a cutting plane in the symmetry with a vertical axis. So that it pass at the center of the hole. So that it is symmetry.

So that I can see it, so now this front view if I am looking at this these are all your hidden lines, how it looks inside? There is a hole here then inside there is a hole then at the middle there is this, then outer it is this. Now you are taking out this, this material is made up of what? After this hole this material is made up of the moment I am doing this hatching it Is made up of steel cast iron. So both the sides the material is same, that means the entire material is same only there is a drill at the top and at the middle .

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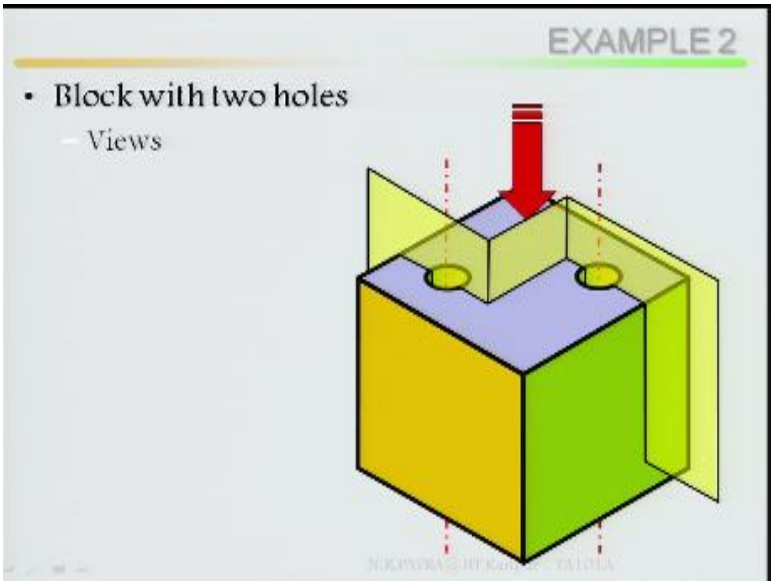

Then block with two holes look at the block there is a block two holes opposition to each other example two, now what is your view? What kind of sectioning I want to do It? These are not symmetry rather this is diametrically opposite. So align sectioning in this case align sectioning has to be done. Now a plane has been taken here passing through the hole then with your 90 degree and taken center line of the hole second plane is going. That means it is align.

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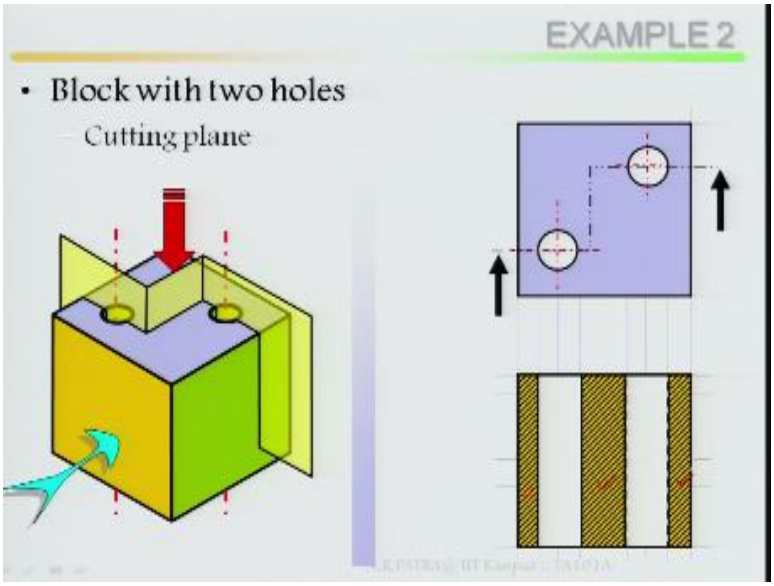

This is your cutting plane you have to choose, choosing of your cutting plane is more important, that means you choosing in such a way that it should pass through this hole. So that hidden part of the Hole you can see it. This your top view, now align sectioning you are doing cut it, this your front view. Now look at this hidden part this is inside Jaden. Now look at this sectioning that means the entire material consists of entire object consists of same material except this holes.

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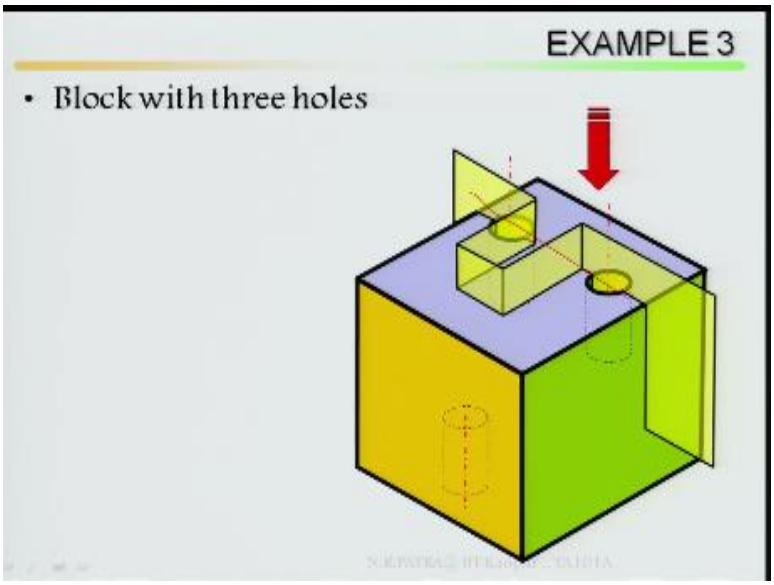

Block with three holes there is a hole here at the time top that means this hole is at the same centre line or aligned you can say that is align but at the same time there is another hole there is another hole this hole is not throughout rather it started with the bottom upto certain section this hole is there, then you have to start with this align sectioning that means you align here then take the plane. So that his hole can be cut it third hole. Then take out this plane again it will go to your other hole.

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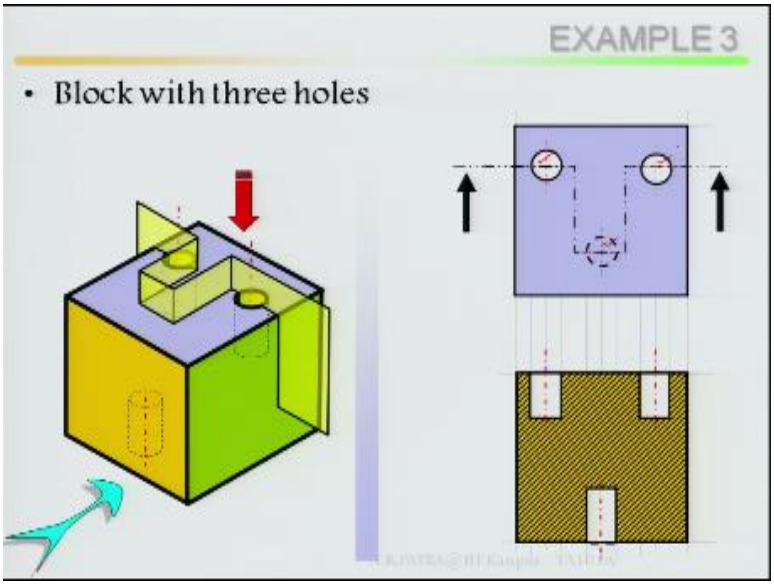

Look at your top view this is the hole, now plane has been passed through first hole align back then it has been passed through your hidden hole then again align back then it has been passed through your second hole. So that once I take it out I can once I do the plane cutting plane here if I take out here and looking from the front that means this half I can see this half I can see this half I can see, how it looks?

Then these are all your holes then object is made up the same material. So it should be hazed with your same lines and either it is 30 degree or maybe sixty-degree or may be 75 degree.

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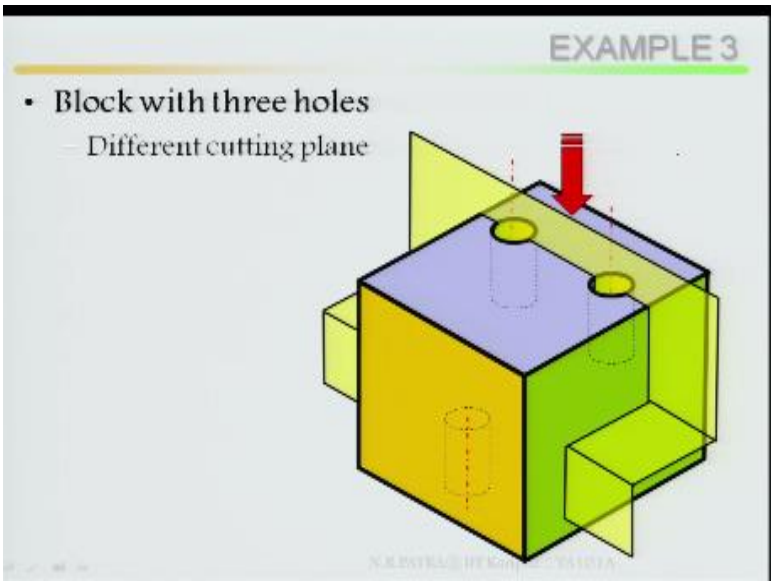

Block with three holes different cutting planes.

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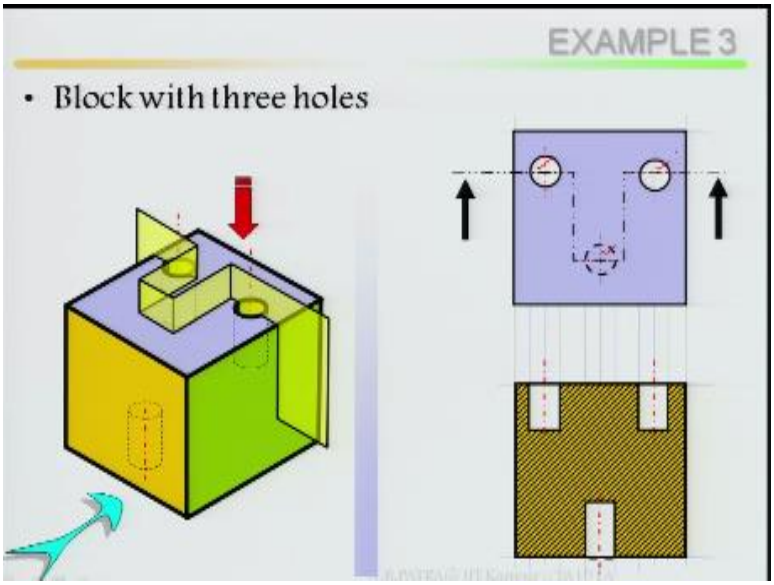

Look at these two examples, it is a one cutting plane.

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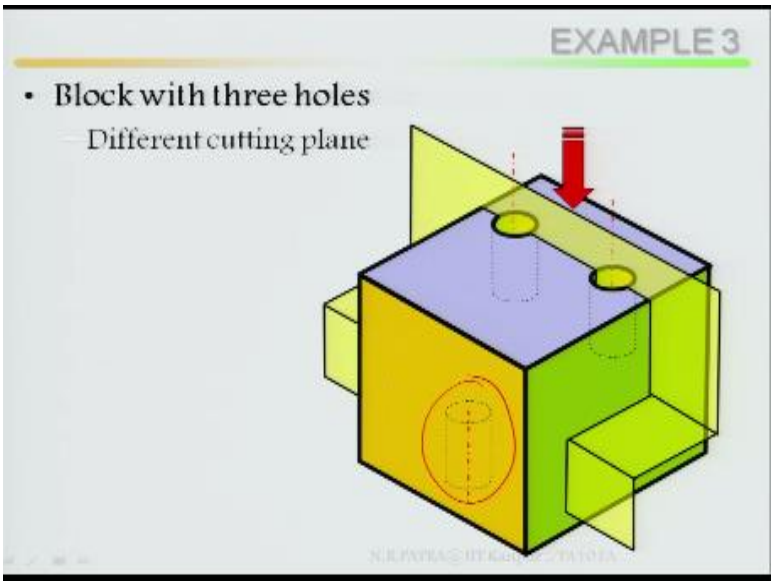

It is a different cutting plane, one cutting plane is align like this and cut it and pass through the cutting plane along this hole. So that you can see it.

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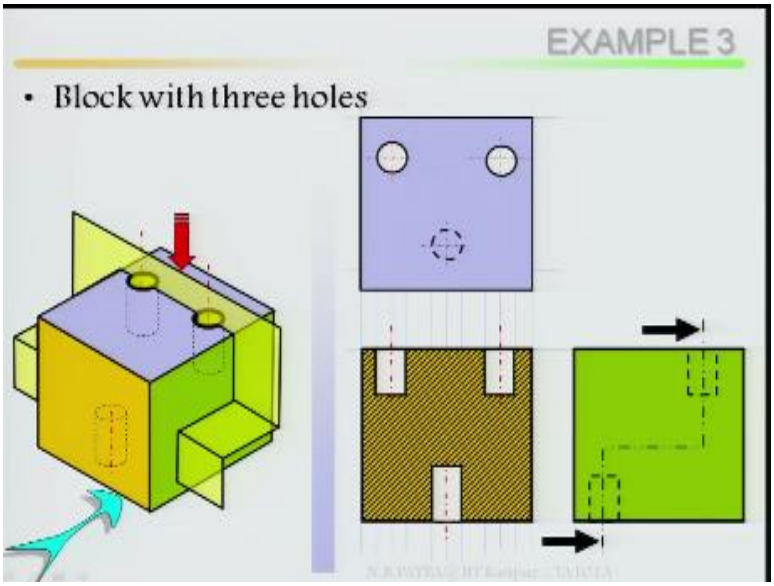

This is my top view, how your front view looks like? And how it the cutting plane has been made? Now after this example these are all brief examples about your aligning means how your cutting plane you are passing through throughout this extends and how you are going to visualize?

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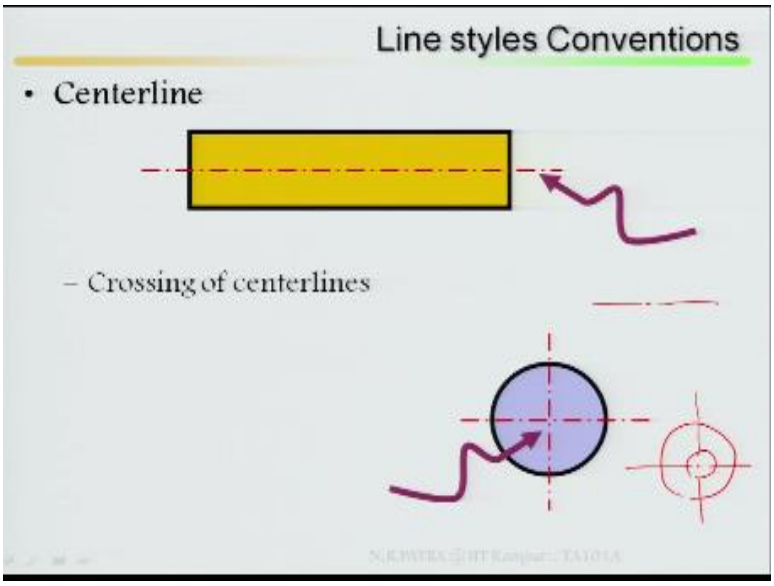

Will continue with few more complicated examples, now center lines, line styles and conventions before I go for further few more examples this your center lines. I have said all earlier centerline this your center line then crossing of your centerlines, this is your crossing of your centre lines that means if there is a circle then crossing of the centerlines here it is going then that means this part is your crossing of your centre lines.

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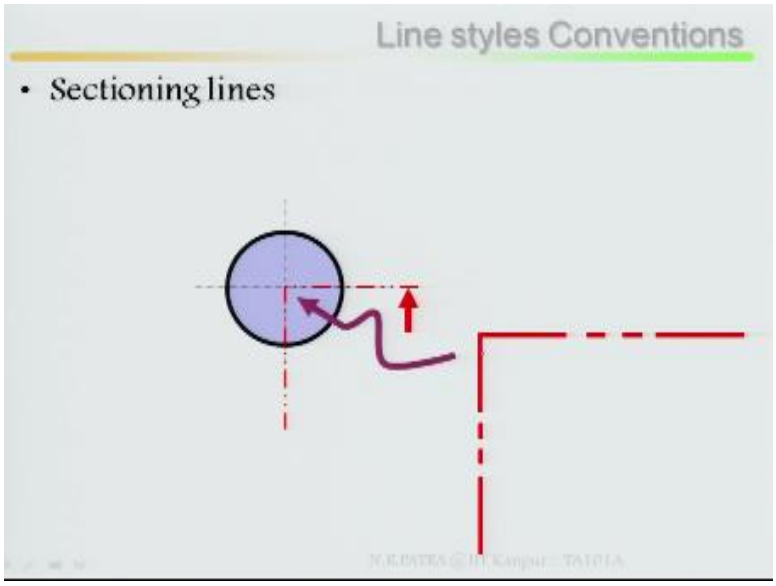

Then sectioning lines look at this sectioning lines how it looks your sectioning lines, if I say one half has been sectioning line has to be plot how your sectioning lines, one line two dash then continuing as second line, one line two dash continuing second line, then both the lines to join there should not be any gap.

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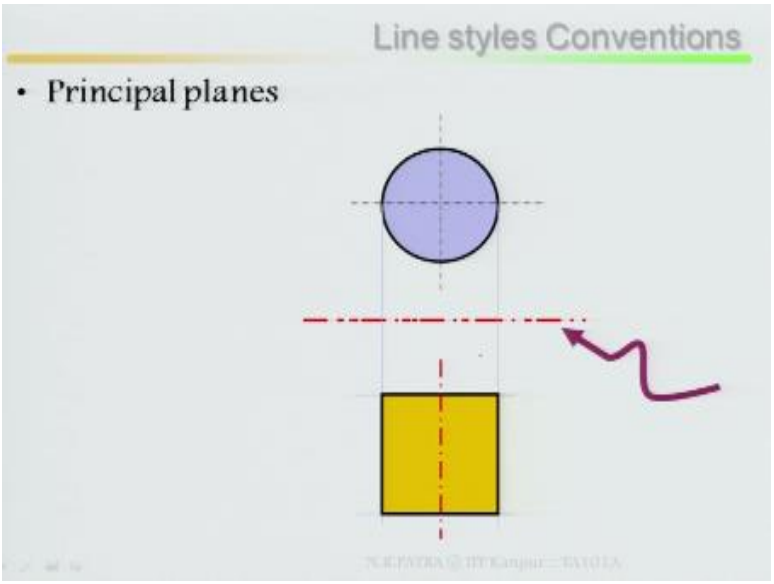

Principal planes this center line.

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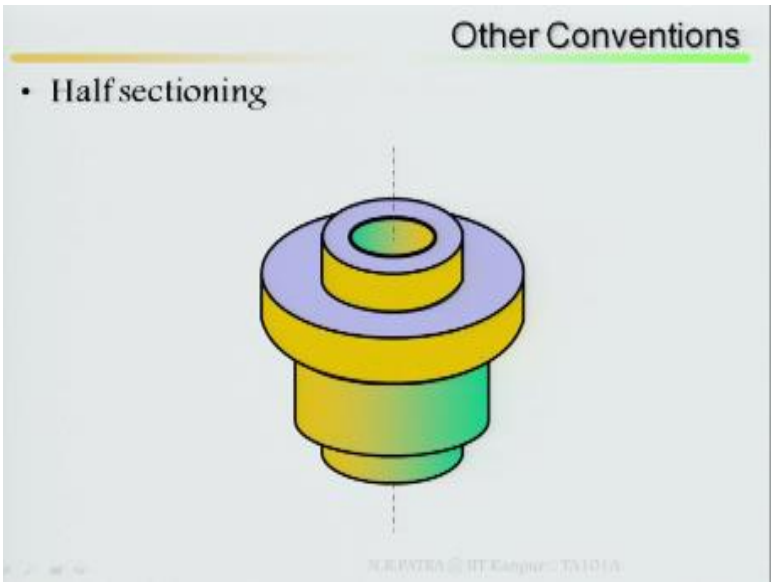

Now look at your half sectioning this is your object.

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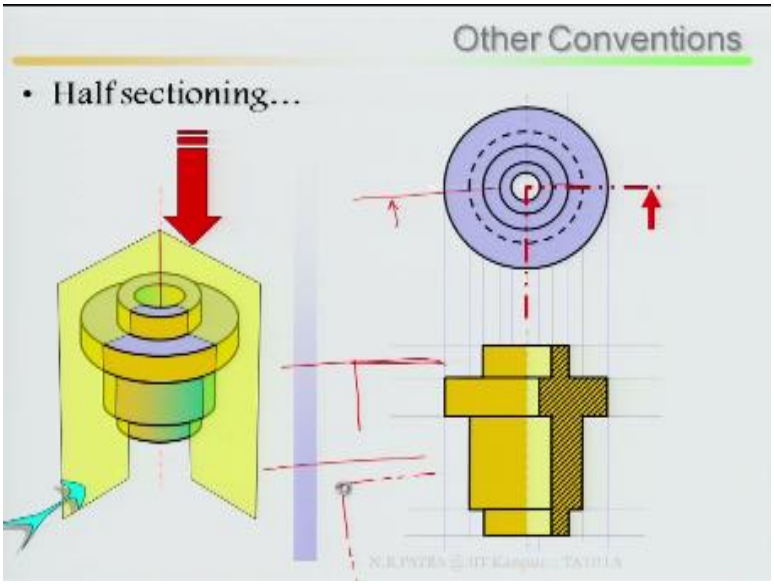

How it looks your half sectioning, the moment I say it is full sectioning that means, from here to here the moment I say it is full sectioning from here to here, the cutting plane should be throughout and I will take out half and look at it. Why it is half sectioning? This is axis symmetric problem that means throughout if I take one quarter, half of the sectioning whatever I am going to see it will be throughout set.

So one-half of the material has been taken out then looking at how it looks, how your plane, sectioning plane how you cut it, one half then like this it has been cut it like this instead of cutting plane this way, it has been made it this way or you can make it this way. Full sectioning you can cut in plane like this, half sectioning and you can make it, this way joining your points end to end, lines end to end.

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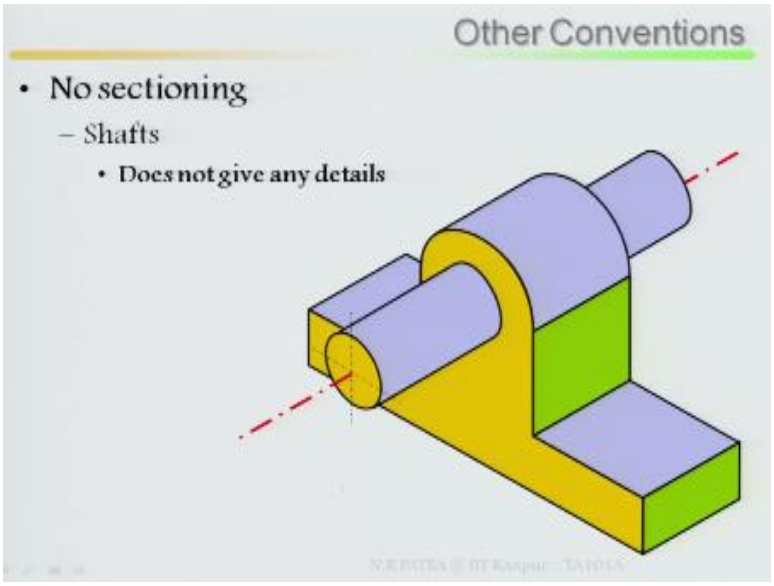

Now no sectioning, there are other certain conventions other conventions no sectioning shaft particularly shaft remember, number one shaft, so shaft does not give any details, so that means if there is a shaft in case of shaft no sectioning should be done.

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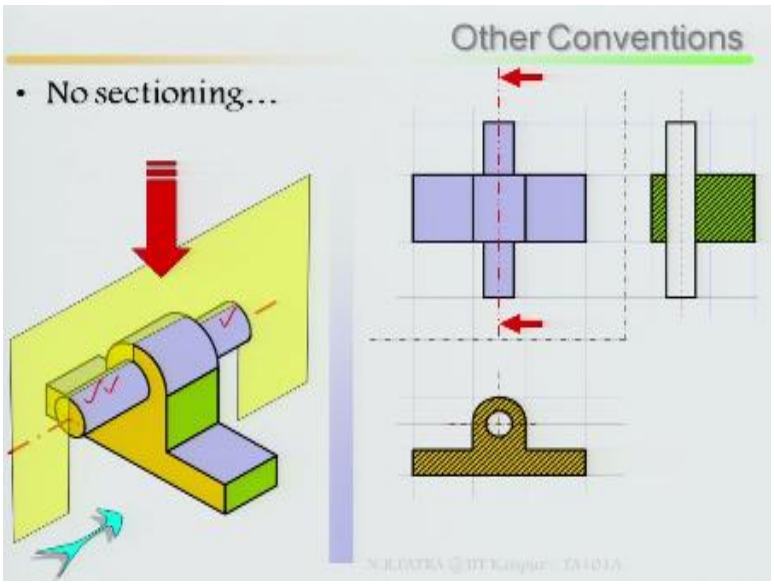

Look at your shaft, I cut it at the middle that means half, full sectioning has been done, then the material has been taken out. How it looks your shaft that means no sectioning has been done particularly in shaft have you mark it, this is your shaft this part is your shaft it is going throughout, this is a material, and this material has been put it. But the moment you cut it the shaft has not been section, cut it in this way, how it looks.

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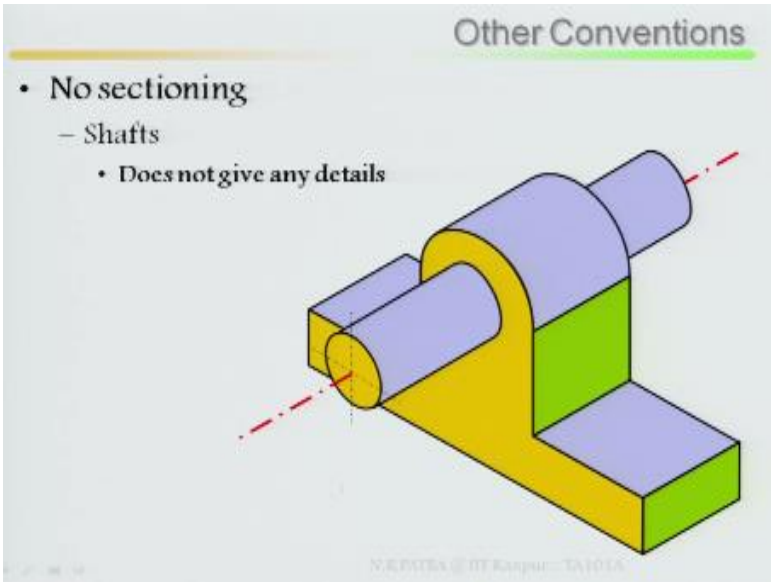

Look like this example very carefully does not give any details of the shaft.

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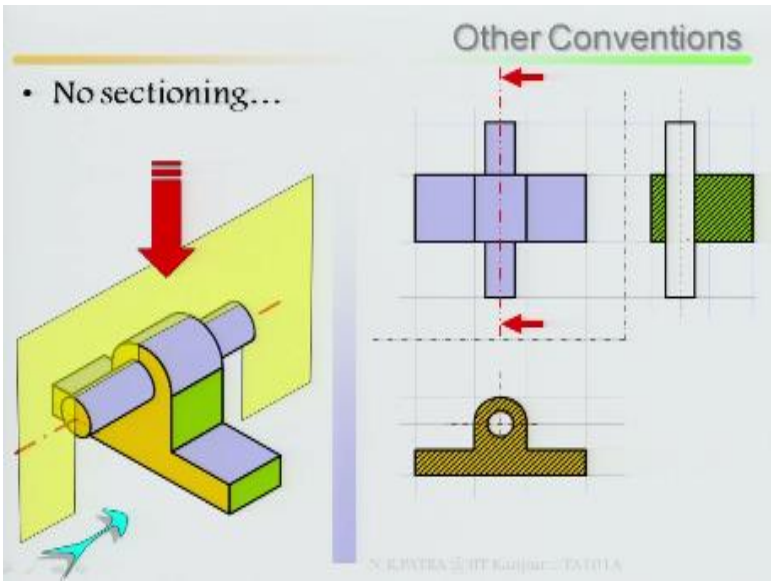

Now there is a shaft is going inside material this shaft is going, now how it looks I am looking at it from the front side, front view. Now this is your top view, now it has been cut it at the center. So now it has been full sectioning has been made. how it looks it looks like this, then along the shaft if you look at why at particularly in shaft no sectioning has been made along the shaft directions you align another sectional plane, another plane how it looks I am taking along the shaft the plane cut it and looked at how it looks, it looks as a shaft. So rule number one for shaft no sectioning is required.

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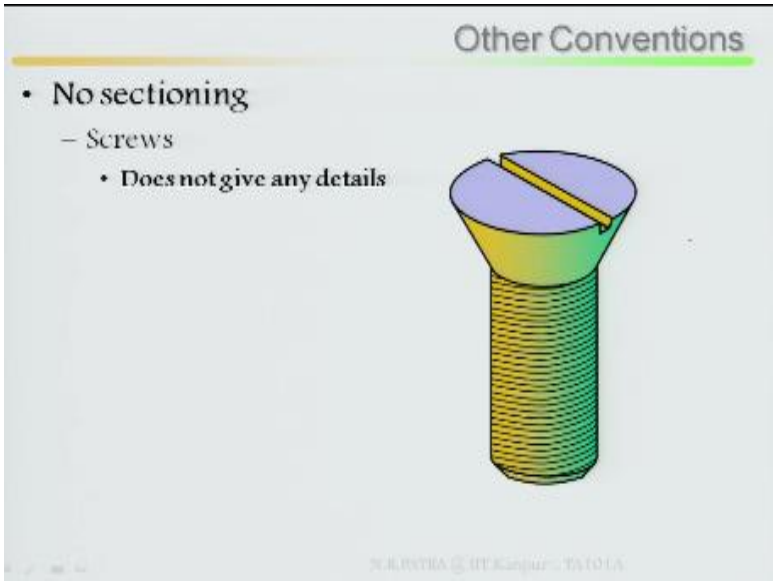

Mo sectioning for screws, screws does not give any details, these are the screws come on you just it does not give any details, so no sectioning.

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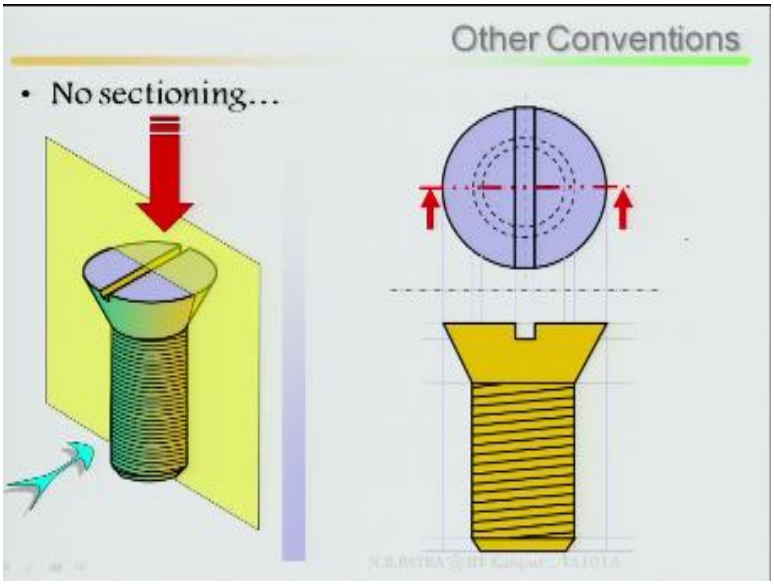

Now look at the screws take out do the sectioning you are not going to get inside anything else.

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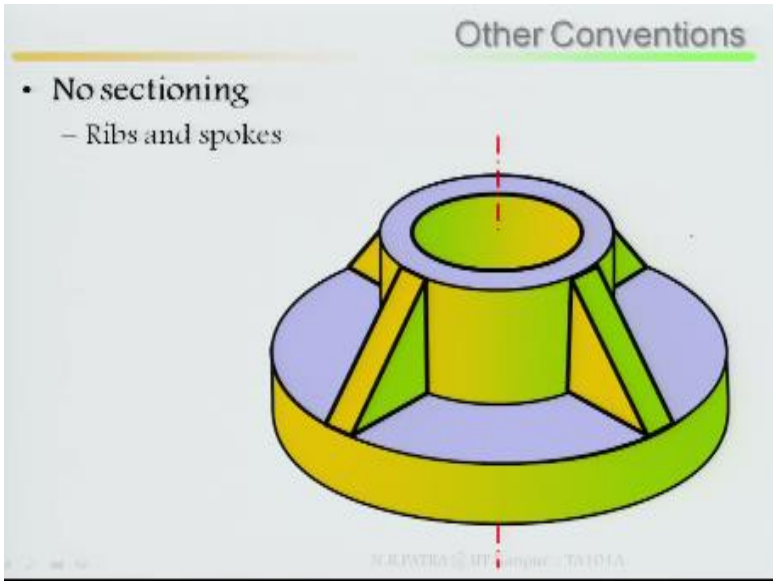

No sectioning ribs and spokes particularly ribs and spokes these are the ribs.

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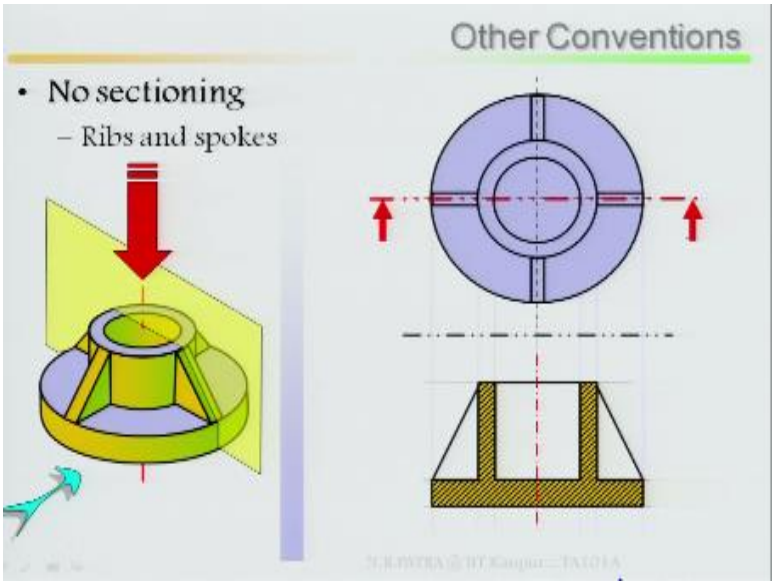

Now if I cut it how it looks then take this external view look at here no sectioning for ribs.

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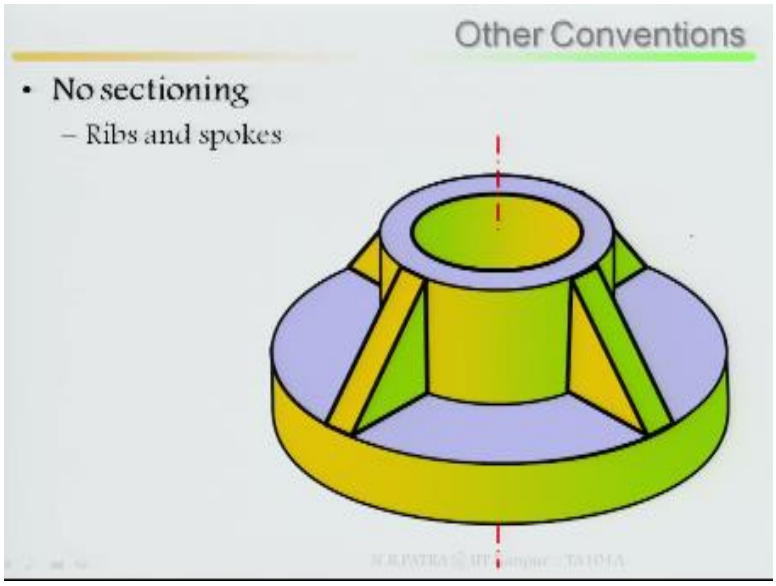

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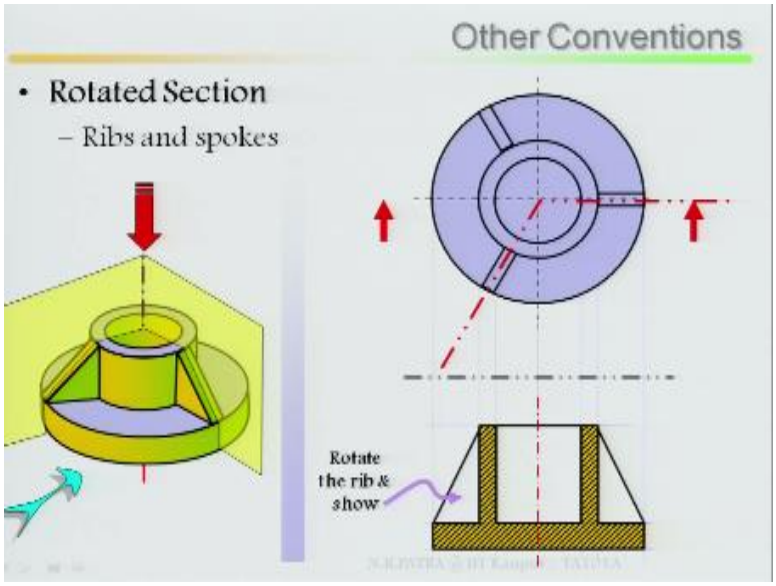

And spokes, now we can rotate the ribs I can rotate the ribs, rotated sections if there is a rib of this planes this planes and this place, here it is your cemented line, so you can rotated back bring back your center line of you sectioning exactly it has been done it has been rotated back, it has been though it has been rotated back. So you can show it symmetry, so that people can understand it has been rotated back.

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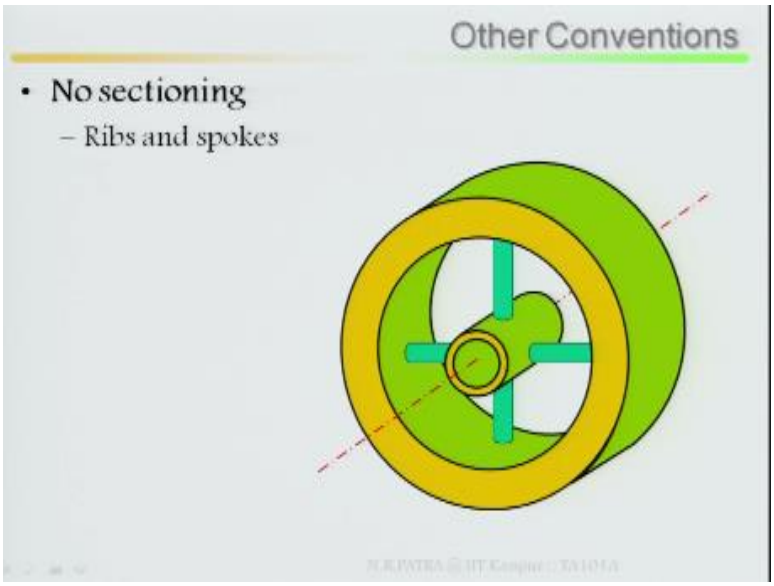

Again no sectioning for ribs spokes.

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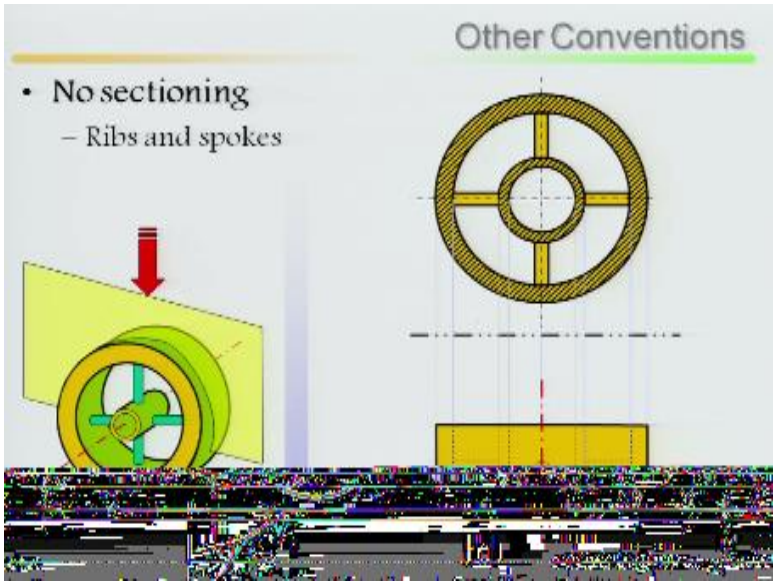
Other Conventions
• No sectioning
– Ribs and spokes

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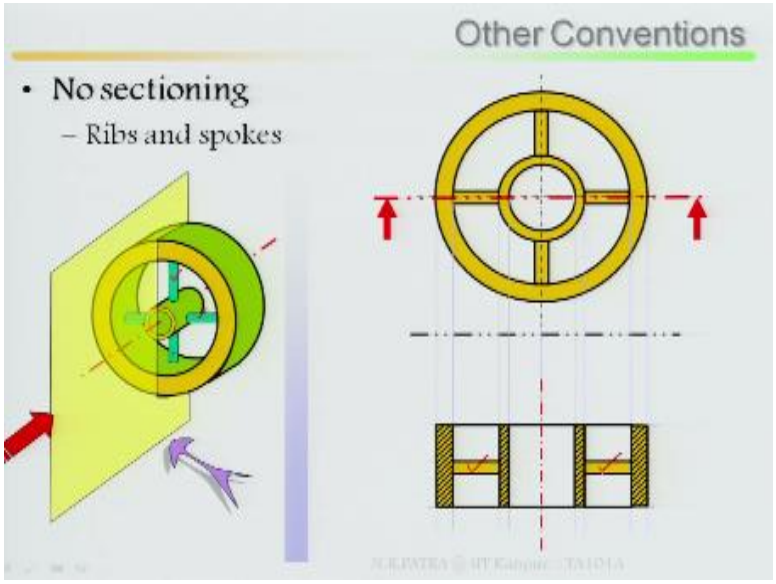

Same thing look at the inside of feature of the ribs, no sectioning, no sectioning means, no hatching am not doing any hatching here, because these are my rib part, these are the materials connected by the rib here, here, here but this is the material so here it is no sectioning that means no hatching.

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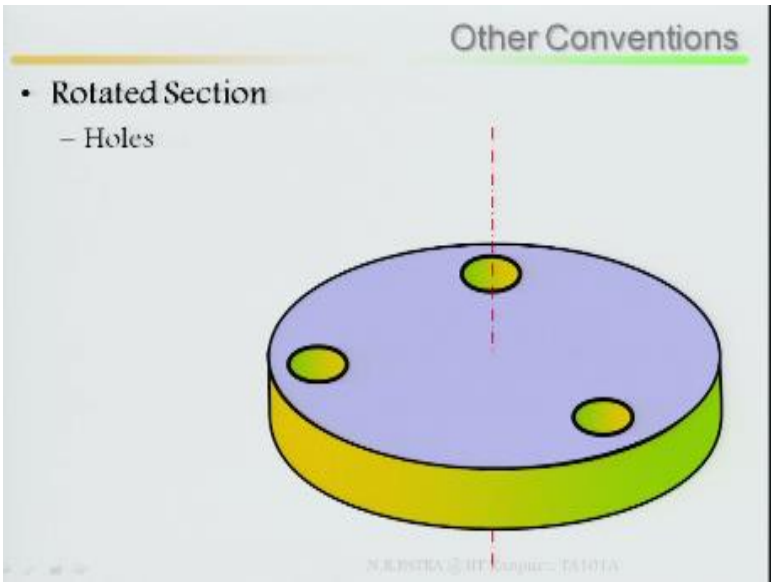

Rotated section holes suppose there are three holes not align with each other, then always you can rotate.

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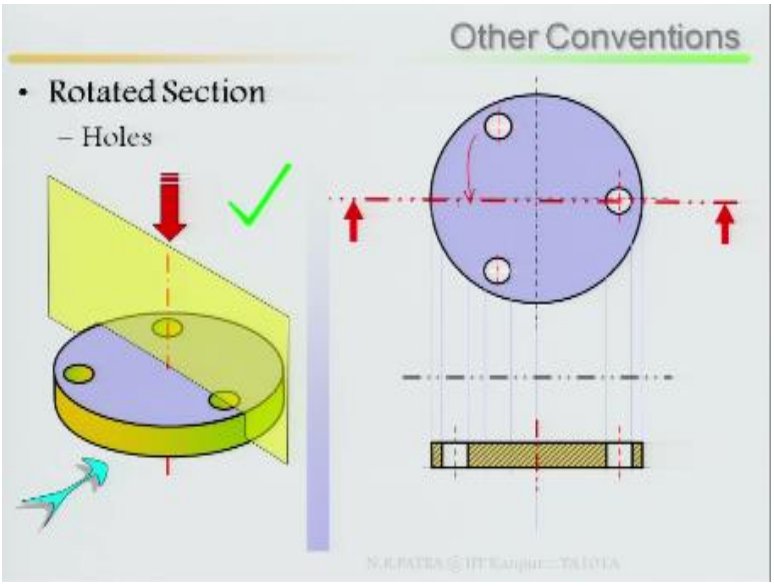

If you look at here this holes in a plate three holes then take a section draw the top view, draw the sectional line where you are going to do this sectioning and which view, which side you are going to view. I want to do the sectioning cutting plane putting here and taken out the entire solid up my front ways and looking at the, from front view, then what you are supposed to do? You rotate this hole back to here or maybe you can rotated it back to here, put it in the align in the center line.

It has been rotated put it here so that it is equal distance so that center here, center here then other material is, is your same material the material is your same material.

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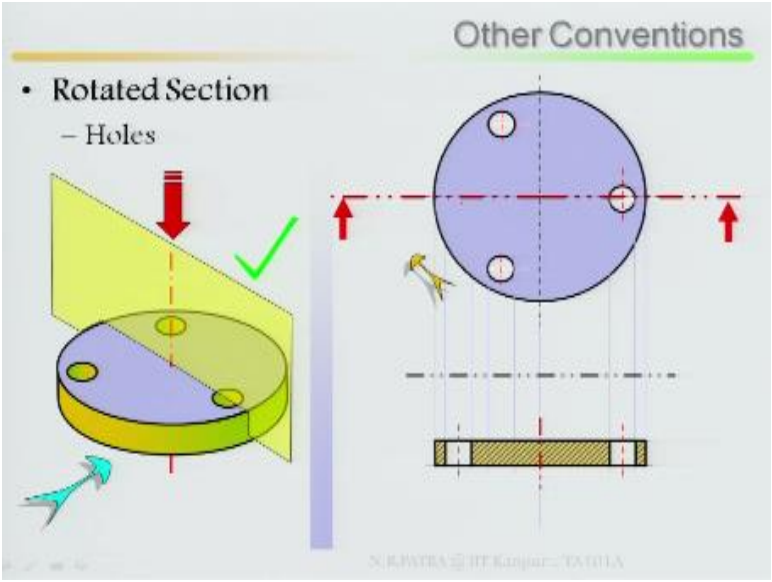

I cannot do this sectioning like this, look at the conventions you have to rotate by means of imaginations it is not necessarily you have to show by means of arrow, but by means of imagination you have to rotate it. But you cannot do the sectioning either by a line or by offset sectioning, you cannot do it, look at here this is wrong and this side by imagination it has been rotated, so that this hole has been rotated so that this hole has been align along the centerline, then taken your sectional view.

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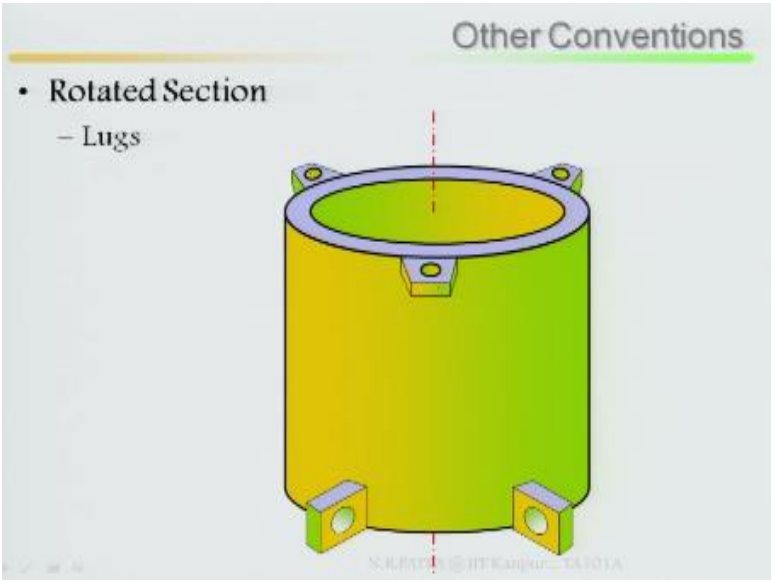

Rotated section lugs, these are the lugs so looked at this.

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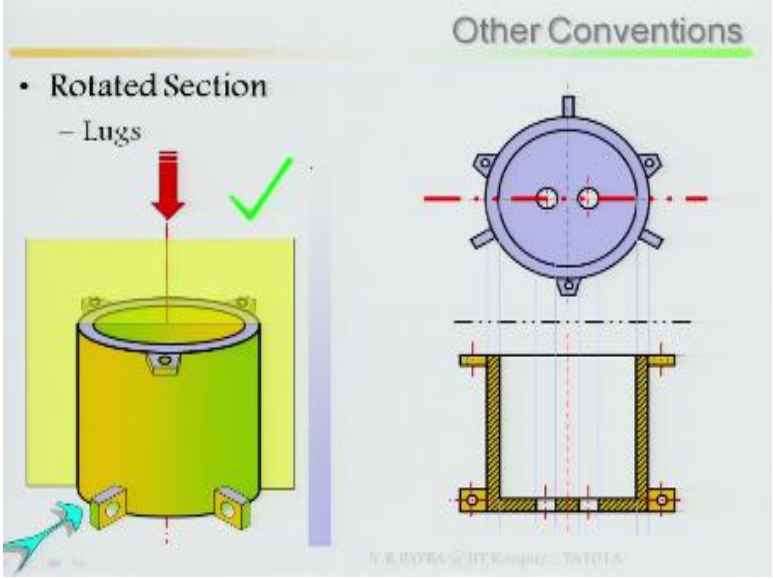

Same way lugs are there this is a centerline where your sectioning has been done, then what you are suppose to do.

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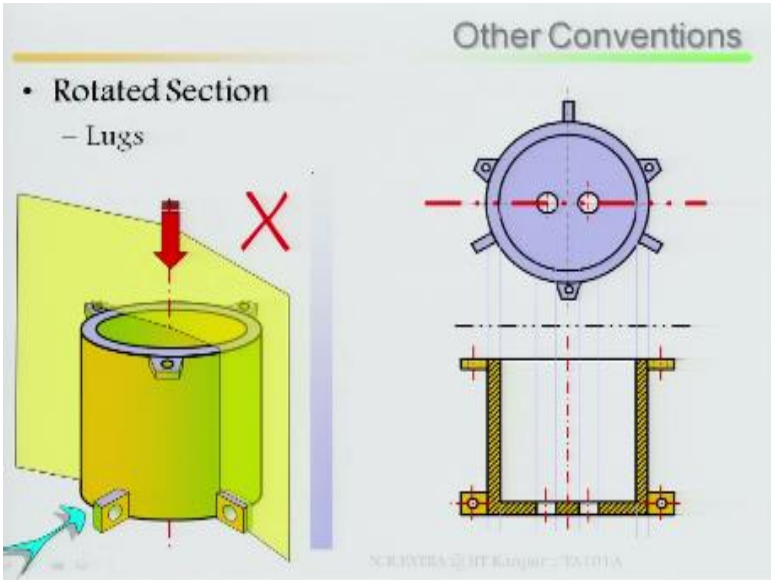

You cannot do it by means offset sectioning or by means of align sectioning, rather this is wrong.

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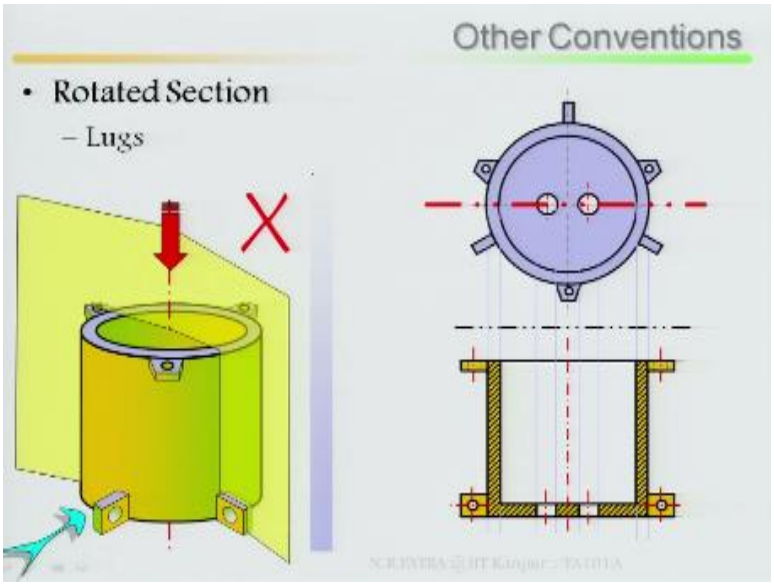

Rather you want to rotate it and align it and show the rotation part.

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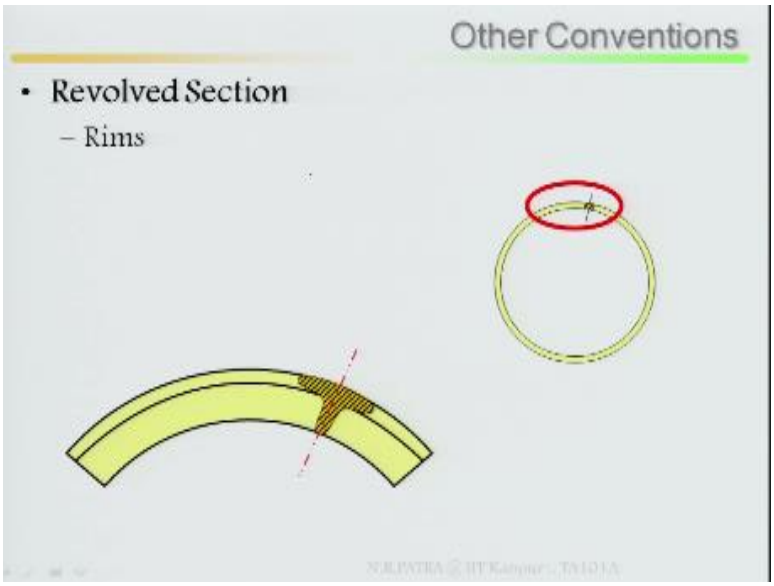

Rims look at the rim, revolved section rim there is a rim here, how the sectioning has been done in the rim not the entire rim, the revolved section how it has been done one part.

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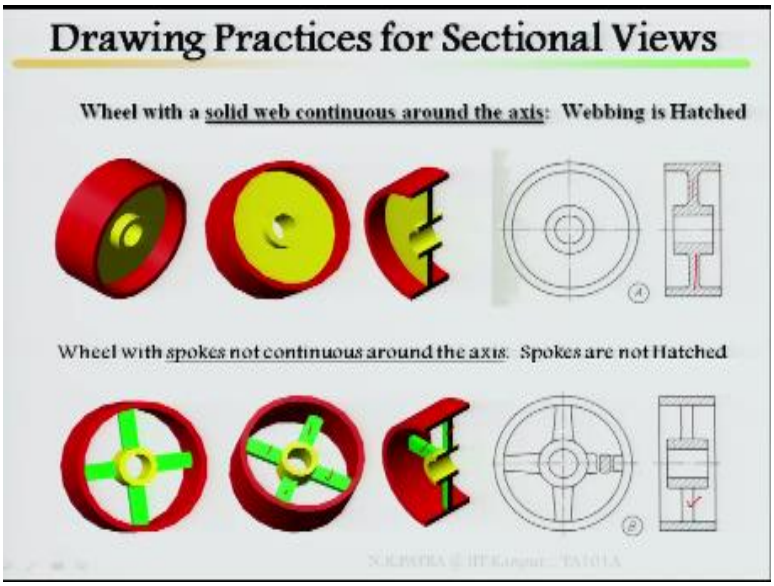

Start with this typical and find of a you can say that this is assembly, if you remember well different types of sectioning, full sectioning, half sectioning offset align rotated removed and other one is your assemble section. Now we are coming to assemble section wheel with a solid web continuous around the axis, there is a wheel with a solid web continuous around the axis. Webbing is hatched in this case webbing is hatched looked at here, how it looks then how it looks, when I cut it.

Wheel with spokes not continues around the axis, spokes are not hatched, what is the difference first one is wheel with a solid web continues around the axis, solid web continuous around the axis then it has to be hatched. You spoke these are the spokes which is not continuous around the axis, it has been put here, here, here, and here it is not continuous throughout, then in that case spokes are not hatched.

When web or spokes are continues around the axis then hatching is required, if it is not continuous then hatching is not required. Look the difference here in this case, this is continuous around this solid web, then it has been hatched so here in this case this spokes are not continuous, rather it has been placed poor. So it is not hatched.

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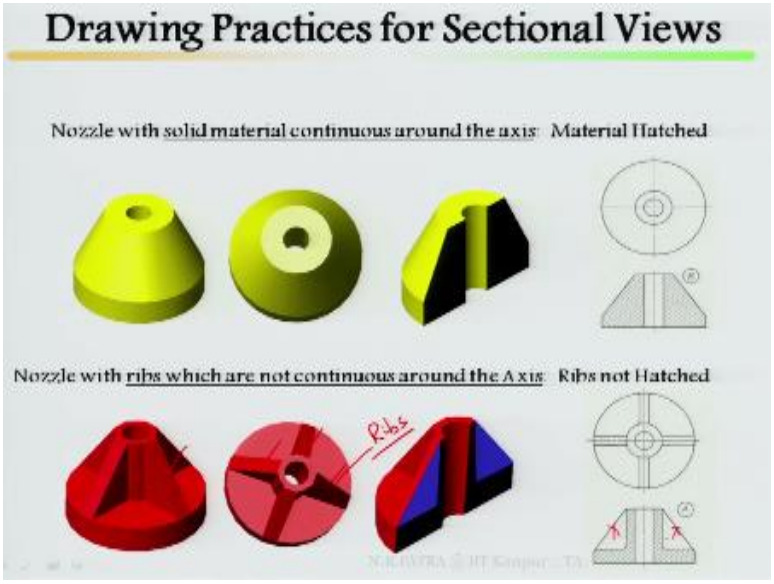

Nozzle with solid material continuous around the axis, nozzle with solid material, there is a solid material then the region nozzle but bit is continuous throughout the axis, then material has to be hatched, material has been hatched. Then look at the difference nozzle with ribs which are not continuous around the axis. Nozzle with ribs these are all your ribs this, this, this, this, this ribs, the ribs are not continuous rather it place the nozzle connected, you can say that it is connected. So in this case ribs are not hatched, if I take it.

But here nozzle is with solid material continuous around the sections that means entire material has been hatched. If you look at here, only material is hatched and this is not hatched, no sectioning.

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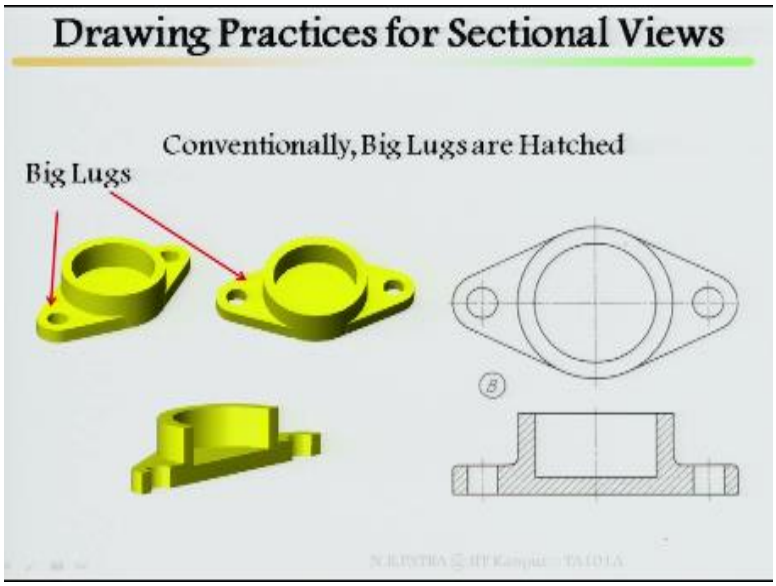

Conventionally big lugs are hatched, look at here these are all big lugs there are lugs earlier I say lugs should not be hatched. Now I am saying big lugs are hatched, big lug, now bog lugs are hatched, if lug is big dimension wise this is a judgment you have to take it, which lug is big, which is not big. This will come over the period of time once you start practicing problems whatever I am showing it if you practice it at your home, then it will come the conventions automatically in your mind that this has to be hatched, this is not going to be hatched.

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But small lugs are not hatched.

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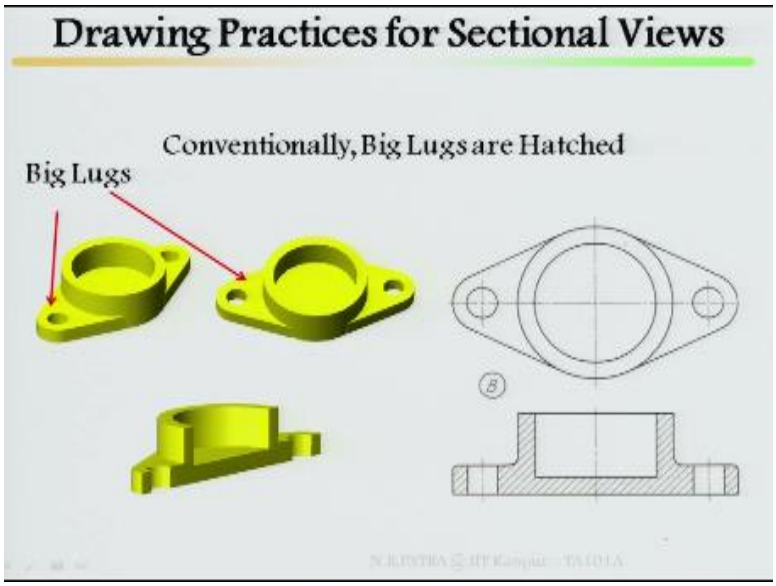

Compare it, this is a big lug.

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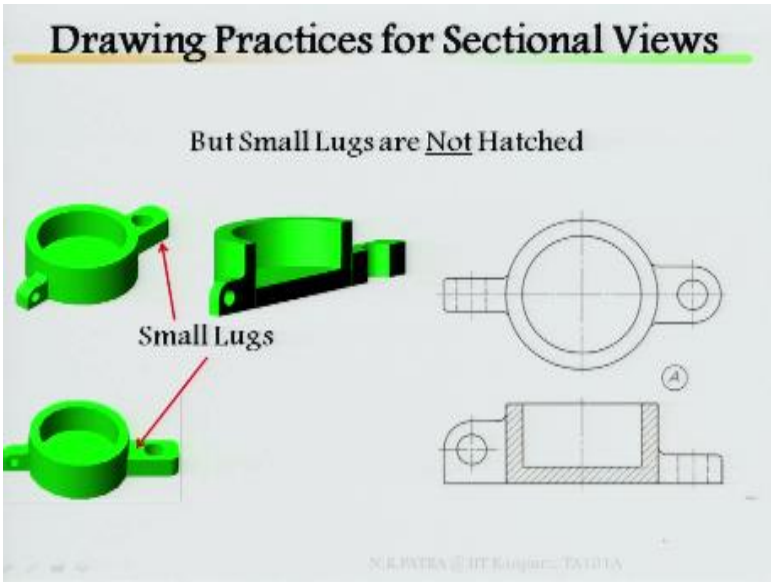

Now there is a small lug, this is a small lugs these are not hatched.

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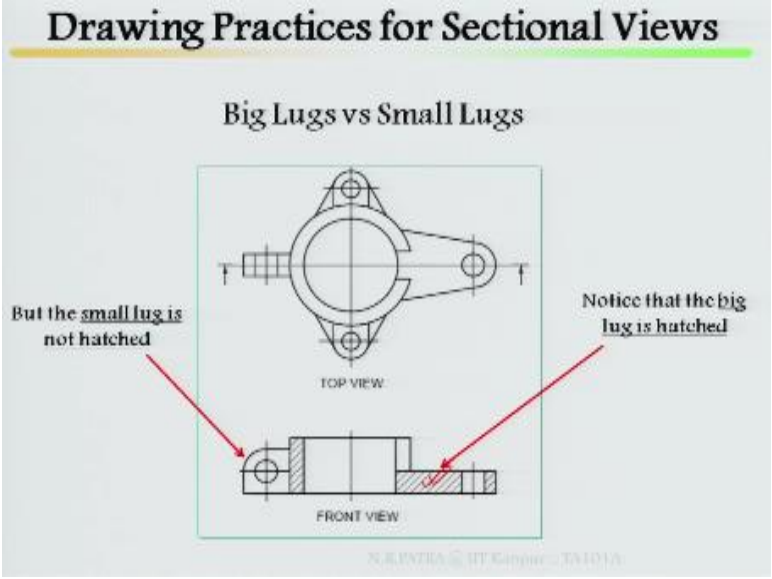

Big lugs versus small lugs, look at the difference notice that big lugs is hatched. But the small lug is not hatched. In a solid there is a big lug as well as there are small lugs, small lugs and there is a big lug, here it is a big lug. So big lug has been hatched, small lug has not hatched, so once you do this drawing ones you show this sectional view in and way this gives an indications, this lug is a big, that is why this hatching has been done. This lug is a small, that is why there is no hatching.

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Fasteners, pins, shafts, bolt heads, rivet heads are not the or, are not suppose to be hatched. Fasteners, pins you put the pins inside, then bolt heads these are not suppose to be hatched, like screw these are not suppose to be hatched. So I will stop it here, so next class I will start assembly sectioning with typical 2, 3 example so that it will be very easy for understanding. Thank you.

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